October 18, 2011 JN 55-100776.001

Mr. John Kim
CITY OF CARLSBAD
1635 Faraday Avenue
Carlsbad, CA 92008

Subject: La Costa Avenue "Before and After" Interim Road Diet Project
Traffic Volume Assessment and Operational Analysis

Dear John:

RBF Consulting has conducted an assessment of traffic volumes and an operational analysis for conditions before and after the interim restriping of La Costa Avenue. The project extends from just west of Fairway Lane to just west of Romeria Street and includes reducing westbound La Costa Avenue from two lanes to one lane. The City restriped the westbound direction of La Costa Avenue between Romeria Street and Fairway Lane from two lanes to one lane in July 2011. Ultimately, the City of Carlsbad will implement a complete road diet and reduce the number of travel lanes in each direction on La Costa Avenue from two lanes to one lane.

The purpose of the La Costa Avenue road diet is to free up space within the existing right-of-way in order to provide Class II bike lanes in each direction of travel and to provide a buffer between the residential driveways and through vehicles on La Costa Avenue. The La Costa Avenue study area and the before/after lane configuration are illustrated in Exhibit 1 and Exhibit 2, respectively.

DATA COLLECTION

The purpose of the "before and after" study is to determine if the interim road diet for the westbound direction of La Costa Avenue resulted in diversion of traffic to other parallel roadways such as Levante Street or Calle Barcelona. The daily traffic volumes were used to evaluate the impact on level of service along the section of La Costa Avenue that has been restriped.

The "before condition" traffic counts were collected in May 2011 on a typical weekday while schools were still in session and prior to the interim restriping of La Costa Avenue. The "after condition" traffic counts were collected in September 2011 on a typical weekday after schools were back in session after the interim restriping of westbound La Costa Avenue was completed.

Traffic counts were collected over a 24-hour period for the following mid-block locations for both the "before" condition (May 2011) and the "after" condition (September 2011):

1. La Costa Avenue, from La Costa Town Center Access to Fairway Lane
2. La Costa Avenue, from Quinta Street to Cadencia Street
3. Levante Street, from Torrejon Place to Sacada Circle
4. Levante Street, from Galleon Way to Romeria Street
5. Calle Barcelona, from Paseo Aliso to Paseo Avellano
6. Rancho Santa Fe Road, from Calle Barcelona to Camino De Las Coches

Morning (7:00 – 9:00 a.m.) and afternoon (4:00 – 6:00 p.m.) peak period intersection counts were also collected at La Costa Avenue / Vieja Castilla Way, the only signalized intersection along the section of La Costa Avenue where the interim road diet has been implemented.

The daily mid-block traffic counts collected before and after the interim road diet on La Costa Avenue are illustrated in Exhibit 3. The peak hour mid-block and intersection counts collected before and after the interim road diet are shown in Exhibit 4. The raw traffic count data is provided in the technical appendix following this report.

BEFORE AND AFTER TRAFFIC VOLUME ASSESSMENT

The traffic count data collected before and after the interim restriping of La Costa Avenue was closely evaluated to determine if the interim road diet for westbound La Costa Avenue resulted in some diversion of traffic to other parallel roadways such as Levante Street or Calle Barcelona. The before and after counts for the parallel roadway corridors were grouped into two screenlines and the changes in the volumes were evaluated as a percentage of the total screenline volumes. By using the screenline methodology, the analysis factors out some of the variability in traffic volumes that typically occurs from day to day.

One screenline was established for the west sides of the parallel roadway corridors and the other on the east sides. The screenline analysis includes daily and peak hour counts for the following roadway segments:

<u>Screenline #1 (West Side)</u>

A. La Costa Avenue from La Costa Town Center to Fairway Lane
C. Levante Street from Torrejon Place to Sacada Circle
E. Calle Barcelona from Paseo Aliso to Paseo Avellano

<u>Screenline #2 (East Side)</u>

B. La Costa Avenue from Quinta Street to Cadencia Street
D. Levante Street from Galleon Way to Romeria Street
E. Calle Barcelona from Paseo Aliso to Paseo Avellano

Counts were collected in only one location on Calle Barcelona; therefore, these counts are used for both screenlines. The two screenlines as described above are also shown graphically in Exhibit 5.

Table 1 presents the comparison of the daily mid-block traffic counts both before and after the La Costa Avenue interim road diet using the screenline method. This screenline comparison method is also shown in Exhibit 6 in a pie chart format.

Table 1
Comparison of Daily Traffic Volumes
Before and After La Costa Avenue Interim Road Diet

Roadway		Segment	Direction	Before Condition		After Condition	
				ADT	% of Screenline ADT	ADT	% of Screenline ADT
Screenline 1 Comparison							
A	La Costa Avenue	La Costa Town Ctr to Fairway Ln	EB	8,703	61.4%	8,579	61.1%
			WB	**8,460**	**60.3%**	**8,682**	**61.8%**
			Total	17,163	60.9%	17,261	61.4%
C	Levante St	Torrejon Pl to Sacada Cir	EB	591	4.2%	680	4.8%
			WB	**713**	**5.1%**	**774**	**5.5%**
			Total	1,304	4.6%	1,454	5.2%
E	Calle Barcelona	Paseo Aliso to Paseo Avellano	EB	4,876	34.4%	4,778	34.0%
			WB	**4,858**	**34.6%**	**4,599**	**32.7%**
			Total	9,734	34.5%	9,377	33.4%
Total (Screenline) A-C-E Eastbound ADT Volumes				**14,170**	**50.2%**	**14,037**	**50.0%**
Total (Screenline) A-C-E Westbound ADT Volumes				**14,031**	**49.8%**	**14,055**	**50.0%**
Total (Screenline) A-C-E ADT Volumes				**28,201**	**100.0%**	**28,092**	**100.0%**
Screenline 2 Comparison							
B	La Costa Avenue	Quinta St to Cadencia St	EB	6,448	51.5%	6,413	52.1%
			WB	**6,260**	**51.1%**	**5,643**	**49.4%**
			Total	12,708	51.3%	12,056	50.8%
D	Levante St	Galleon Way to Romeria St	EB	1,187	9.5%	1,128	9.2%
			WB	**1,142**	**9.3%**	**1,179**	**10.3%**
			Total	2,329	9.4%	2,307	9.7%
E	Calle Barcelona	Paseo Aliso to Paseo Avellano	EB	4,876	39.0%	4,778	38.8%
			WB	**4,858**	**39.6%**	**4,599**	**40.3%**
			Total	9,734	39.3%	9,377	39.5%
Total (Screenline) B-D-E Eastbound ADT Volumes				**12,511**	**50.5%**	**12,319**	**51.9%**
Total (Screenline) B-D-E Westbound ADT Volumes				**12,260**	**49.5%**	**11,421**	**48.1%**
Total (Screenline) B-D-E ADT Volumes				**24,771**	**100.0%**	**23,740**	**100.0%**

Note: Volumes shaded in gray and shown in bold indicate the direction (westbound) where the interim road diet on La Costa Avenue was implemented.

As shown in Table 1, the changes in daily traffic volumes expressed as percentages of total screenline ADT varies by less than two percent for all of the roadway segments before and after the interim road diet. Daily fluctuations of up to 10 percent are considered normal for traffic volumes from one day to another on parallel roadway corridors. Therefore, variations that exceed 10 percent from one day to another can be considered a significant change in the traffic patterns on the parallel roadway corridors.

While the comparison of the before and after traffic volumes using the screenline method does factor out some of the day-to-day variability, variation of less than two percent in the proportion of individual segment ADT to total screenline ADT is not considered significant and is within the range of daily traffic fluctuations that is considered normal. Therefore, based on the assessment of daily traffic volumes before and after the La Costa Avenue interim road diet, it does not appear that there is significant diversion of daily traffic to Levante Street or Calle Barcelona.

Table 2 presents the comparison of the peak hour mid-block traffic counts both before and after the La Costa Avenue interim road diet using the screenline method.

As shown in Table 2, the changes in peak hour volumes expressed as percentages of total screenline peak hour volumes varies from zero to approximately five percent. Although the before and after comparison does show slightly more fluctuation in the peak hour volumes than in the daily volumes, the variation is still low enough to be considered within the range of normal fluctuations in traffic from one day to another. Therefore, based on the assessment of peak hour traffic volumes before and after the La Costa Avenue interim road diet, it does not appear that there is a significant diversion of peak hour traffic to Levante Street or Calle Barcelona.

Table 2
Comparison of Peak Hour Traffic Volumes
Before and After La Costa Avenue Interim Road Diet

Roadway		Segment	Direction	Before Condition Peak Hour Volumes		% of Screenline Peak Hour Volumes		After Condition Peak Hour Volumes		% of Screenline Peak Hour Volumes	
				AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Screenline 1 Comparison											
A	La Costa Avenue	La Costa Town Ctr to Fairway Ln	EB	432	900	57.8%	59.5%	396	951	57.8%	62.0%
			WB	**970**	**590**	**56.0%**	**56.2%**	**981**	**571**	**56.3%**	**55.9%**
			Total	1,402	1,490	56.6%	58.1%	1,377	1,522	56.7%	59.6%
C	Levante St	Torrejon Pl to Sacada Cir	EB	64	48	8.6%	3.2%	59	59	8.6%	3.8%
			WB	**67**	**65**	**3.9%**	**6.2%**	**72**	**77**	**4.1%**	**7.5%**
			Total	131	113	5.3%	4.4%	131	136	5.4%	5.3%
E	Calle Barcelona	Paseo Aliso to Paseo Avellano	EB	251	565	33.6%	37.3%	230	523	33.6%	34.1%
			WB	**694**	**395**	**40.1%**	**37.6%**	**690**	**373**	**39.6%**	**36.5%**
			Total	945	960	38.1%	37.5%	920	896	37.9%	35.1%
Total (Screenline) A-C-E Eastbound Peak Hour Volumes				**747**	**1,513**	**30.1%**	**59.0%**	**685**	**1,533**	**28.2%**	**60.0%**
Total (Screenline) A-C-E Westbound Peak Hour Volumes				**1,731**	**1,050**	**69.9%**	**41.0%**	**1,743**	**1,021**	**71.8%**	**40.0%**
Total (Screenline) A-C-E Peak Hour Volumes				**2,478**	**2,563**	**100.0%**	**100.0%**	**2,428**	**2,554**	**100.0%**	**100.0%**
Screenline 2 Comparison											
B	La Costa Avenue	Quinta St to Cadencia St	EB	445	629	51.9%	48.5%	409	666	55.3%	51.3%
			WB	**677**	**458**	**46.0%**	**48.1%**	**619**	**397**	**42.5%**	**45.2%**
			Total	1,122	1,087	48.2%	48.4%	1,028	1,063	46.8%	48.9%
D	Levante St	Galleon Way to Romeria St	EB	161	102	18.8%	7.9%	101	108	13.6%	8.3%
			WB	**101**	**99**	**6.9%**	**10.4%**	**148**	**109**	**10.2%**	**12.4%**
			Total	262	201	11.2%	8.9%	249	217	11.3%	10.0%
E	Calle Barcelona	Paseo Aliso to Paseo Avellano	EB	251	565	29.3%	43.6%	230	523	31.1%	40.3%
			WB	**694**	**395**	**47.1%**	**41.5%**	**690**	**373**	**47.4%**	**42.4%**
			Total	945	960	40.6%	42.7%	920	896	41.9%	41.2%
Total (Screenline) B-D-E Eastbound Peak Hour Volumes				**857**	**1,296**	**36.8%**	**57.7%**	**740**	**1,297**	**33.7%**	**59.6%**
Total (Screenline) B-D-E Westbound Peak Hour Volumes				**1,472**	**952**	**63.2%**	**42.3%**	**1,457**	**879**	**66.3%**	**40.4%**
Total (Screenline) B-D-E Peak Hour Volumes				**2,329**	**2,248**	**100.0%**	**100.0%**	**2,197**	**2,176**	**100.0%**	**100.0%**

Note: Volumes shaded in gray and shown in bold indicate the direction (westbound) where the interim road diet on La Costa Avenue was implemented.

LEVEL OF SERVICE OPERATIONAL ANALYSIS

Peak Hour Intersection Operations

Peak hour level of service operations before and after the La Costa Avenue interim road diet was evaluated at the intersection of La Costa Avenue / Viejo Castilla Way, which is the only signalized intersection along the section of La Costa Avenue where the interim restriping has been implemented.

Consistent with the City of Carlsbad Growth Management Program, the Intersection Capacity Utilization (ICU) method was used to determine intersection Level of Service (LOS). The City of Carlsbad Growth Management Program circulation standards allow LOS D or better operations for intersections during peak hours. Additionally, if an intersection operates at LOS E or F without the project, a significant project impact will occur if the project increases the V/C ratio at an intersection by more than 0.020.

Table 3 summarizes the results of the peak hour LOS analysis at the intersection of La Costa Avenue / Viejo Castilla Way, before and after the completion of the La Costa Avenue interim road diet. ICU worksheets are provided in the technical appendix following this report.

Table 3
Existing Before and After Conditions
Peak Hour Intersection Operational Analysis

Intersection	Conditions Before				Conditions After				AM Change in V/C	PM Change in V/C
	A.M. Peak		P.M. Peak		A.M. Peak		P.M. Peak			
	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS		
La Costa Avenue / Viejo Castilla Way	0.490	A	0.401	A	0.768	C	0.578	A	0.278	0.177

As shown in Table 3, the study intersections operate at acceptable levels of service (LOS D or better) during the peak hours both before and after the interim restriping of La Costa Avenue. Therefore, the reduction in capacity at the westbound approach of the intersection of La Costa Avenue / Viejo Castilla Way does not result in a significant traffic impact.

Peak Hour Roadway Segment Operations

A peak hour analysis was performed for conditions before and after the La Costa Avenue interim road diet on the roadway segments where the interim restriping has occurred on La Costa Avenue. Peak hour segment LOS is determined by taking the average one-way traffic volume in either direction and dividing that volume by the segment peak hour capacity to yield the segment V/C ratio. A maximum capacity of 1,800 vehicles per hour per lane (VPHPL) was used. The peak hour roadway segment analysis methodology that is used is consistent with the City of Carlsbad Growth Management Program.

The City of Carlsbad Growth Management Program circulation standards allow LOS D or better operations for street segments during peak hours. Additionally if an intersection operates at LOS E or F without the project, a significant project impact will occur if the project increases the V/C ratio on a roadway segment by more than 0.020.

The peak hour roadway segment analysis was performed for the following roadway segments:

- La Costa Avenue from Fairway Lane to Vieja Castilla Way (west side of road diet section)
- La Costa Avenue from Vieja Castilla Way to Romeria Street (east side of road diet section)

Traffic counts were only collected on segments of La Costa Avenue that are beyond the limits of the interim road diet section (Fairway Lane to Romeria Street). Therefore, in order to perform the peak hour segment analysis, the traffic counts collected between La Costa Town Center and Fairway Lane were applied to the analysis of the segment between Fairway Lane and Vieja Castilla Way. On the east side of the study area, the traffic counts collected between Quinta Street and Cadencia Street were applied to the analysis of the segment between Vieja Castilla Way and Romeria Street. The traffic counts collected on the west side are probably slightly higher than the volume on the corresponding west study segment, while the traffic counts collected on the east side are probably slightly lower than the volume on the corresponding east study segment. It is our professional opinion that the slight differences between the count and study locations do not affect the findings of the analysis.

Table 4 summarizes the results of the peak hour roadway segment analysis for the two study roadway segments along the section of La Costa Avenue where the interim road diet has occurred. As shown in Table 4, the study roadway segments operate at LOS A during the peak hours both before and after the interim restriping of La Costa Avenue. Therefore, the reduction in capacity on westbound La Costa Avenue as a result of the interim road diet does not result in a significant traffic impact.

Table 4
Before and After Conditions
Peak Hour Roadway Segment Operational Analysis

Segment of La Costa Avenue	Conditions Before Interim Road Diet								Conditions After Interim Road Diet								AM Change in V/C	PM Change in V/C
	Direction (Lanes)	Capacity	AM Peak Hour			PM Peak Hour			Direction (Lanes)	Capacity	AM Peak Hour			PM Peak Hour				
			Vol.	V/C	LOS	Vol.	V/C	LOS			Vol.	V/C	LOS	Vol.	V/C	LOS		
Fairway Lane to Vieja Castilla Way	EB (2)	3,600	432	0.120	A	900	0.250	A	EB (2)	3,600	396	0.110	A	951	0.264	A	-0.010	0.014
	WB (2)	3,600	970	0.269	A	590	0.164	A	WB (1)	1,800	981	0.545	A	571	0.317	A	0.276	0.153
Vieja Castilla Way to Romeria Street	EB (2)	3,600	445	0.124	A	629	0.175	A	EB (2)	3,600	409	0.114	A	666	0.185	A	-0.010	0.010
	WB (2)	3,600	677	0.188	A	458	0.127	A	WB (1)	1,800	619	0.344	A	397	0.221	A	0.156	0.093

SUMMARY AND CONCULSIONS

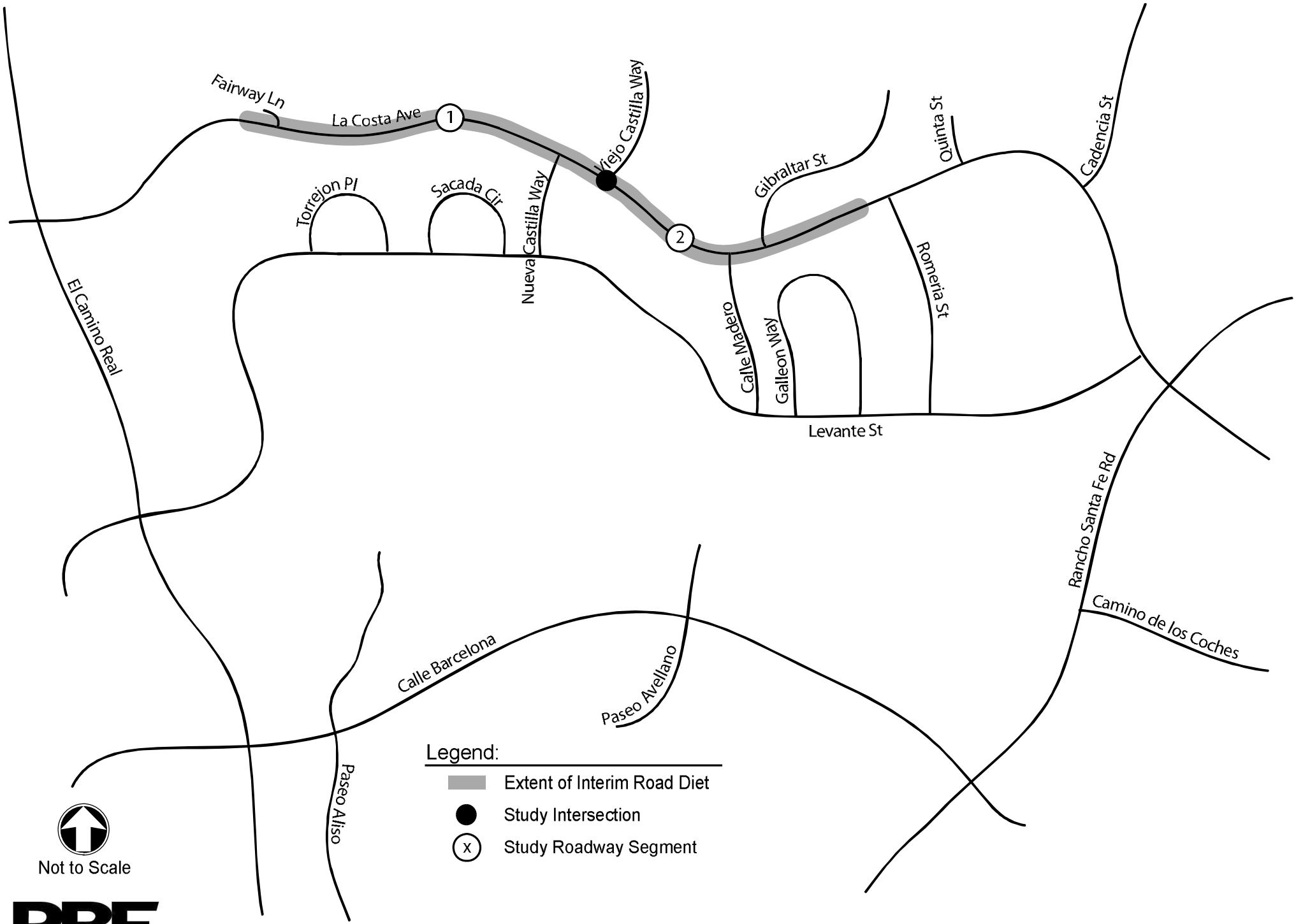
The traffic count data collected before and after the interim restriping of La Costa Avenue was closely evaluated to determine if the interim road diet for westbound La Costa Avenue resulted in diversion of traffic to other parallel roadways such as Levante Street or Calle Barcelona. The results of the traffic volumes assessment before and after the La Costa interim road diet show that the variations in the before and after traffic volumes are not significant enough to indicate that any diversion of traffic has occurred.

The results of the level of service operational analysis show that the study intersection and study roadway segments operate at acceptable levels of service both before and after the La Costa Avenue interim road diet. Therefore, the reduction in capacity on westbound La Costa Avenue following the completion of the interim road diet does not result in significant traffic impacts on the study intersection or roadway segments.

If you should have any questions regarding this analysis, please call me at (760) 603-6246.

Sincerely,

Dawn L. Wilson, P.E., T.E., PTOE
Senior Associate
Transportation Services



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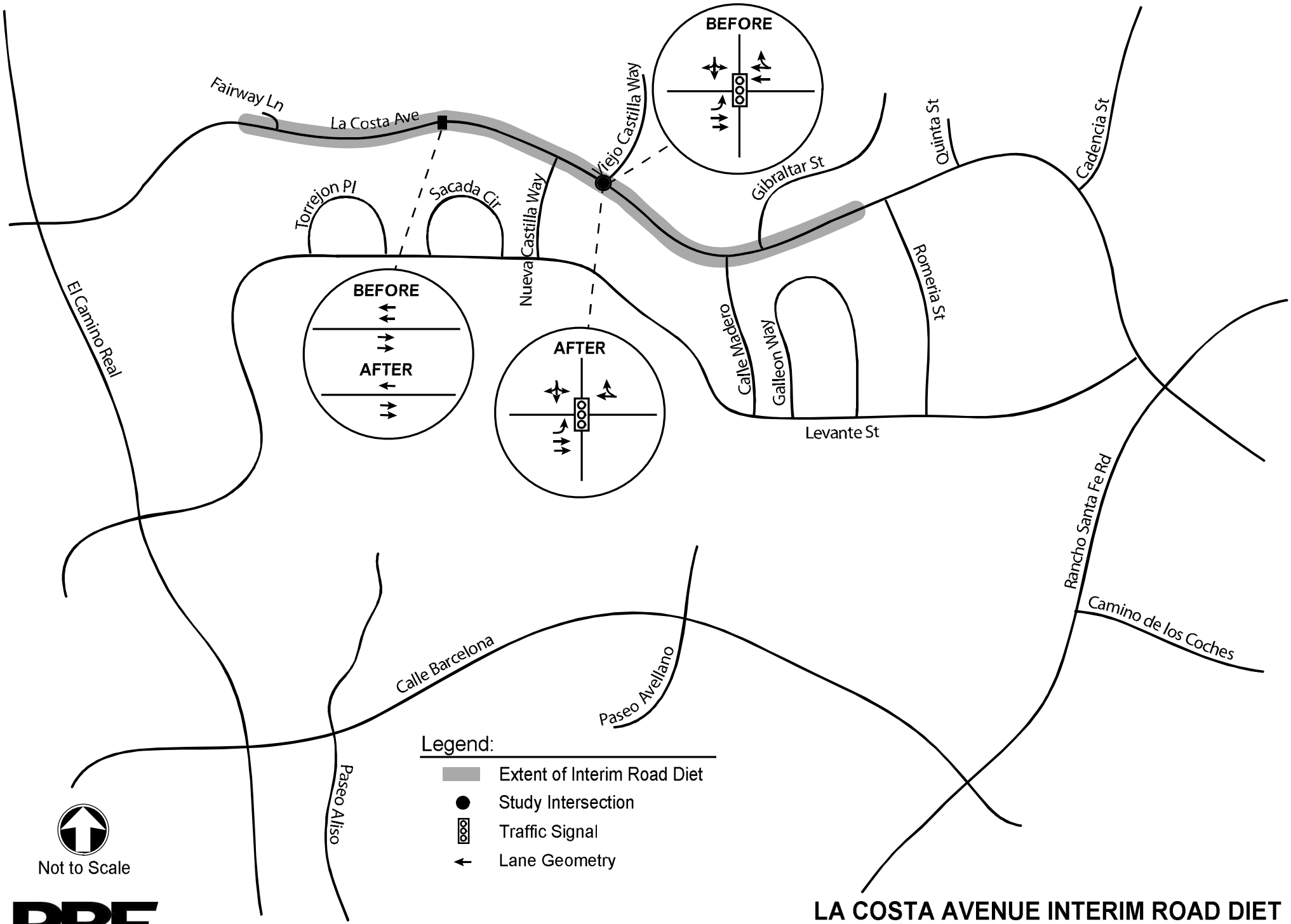
JN 55-100776.001 OCTOBER 2011

PROJECT STUDY AREA

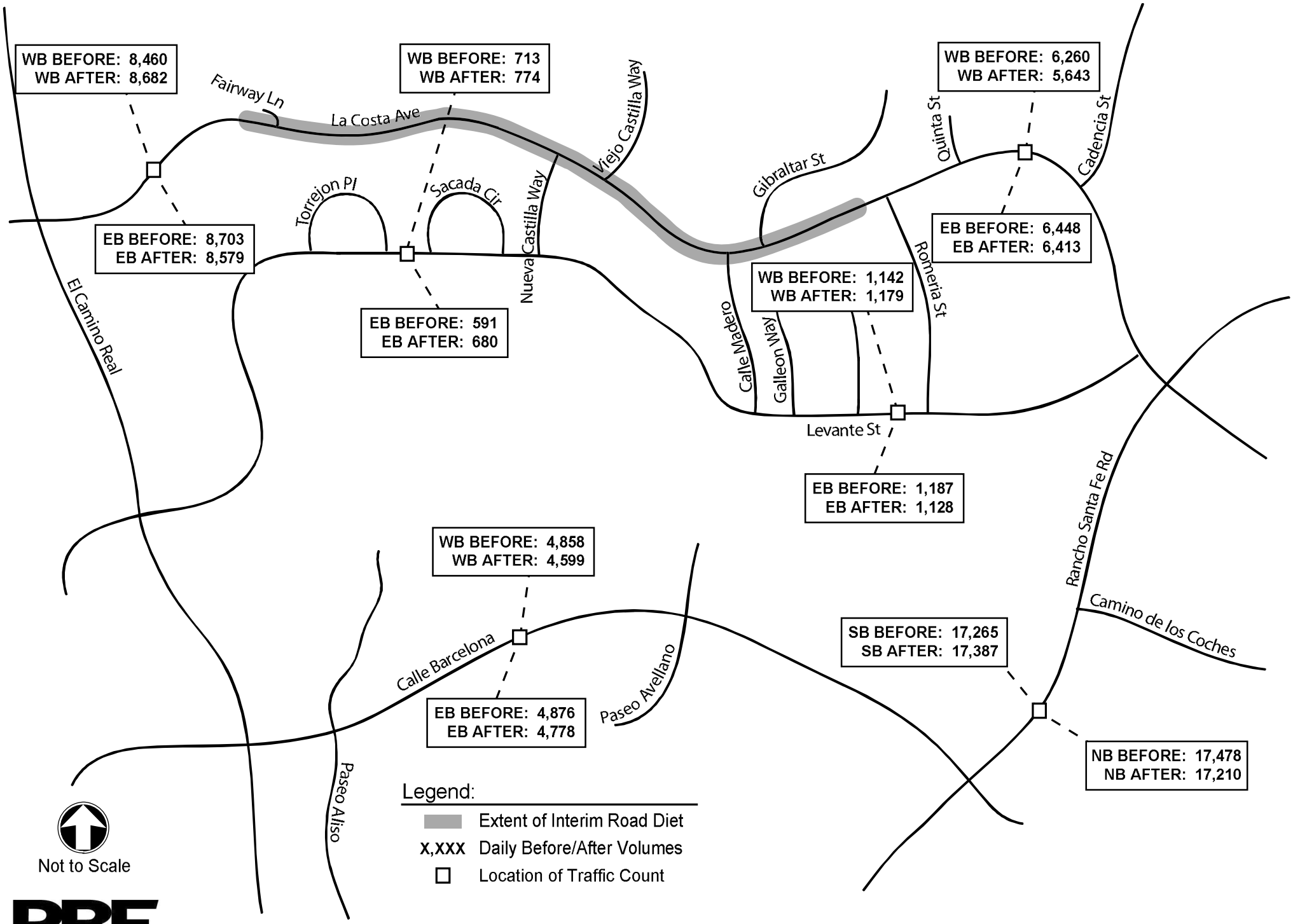
Exhibit 1



LA COSTA AVENUE INTERIM ROAD DIET
BEFORE AND AFTER LANE GEOMETRY

JN 55-100776.001 OCTOBER 2011

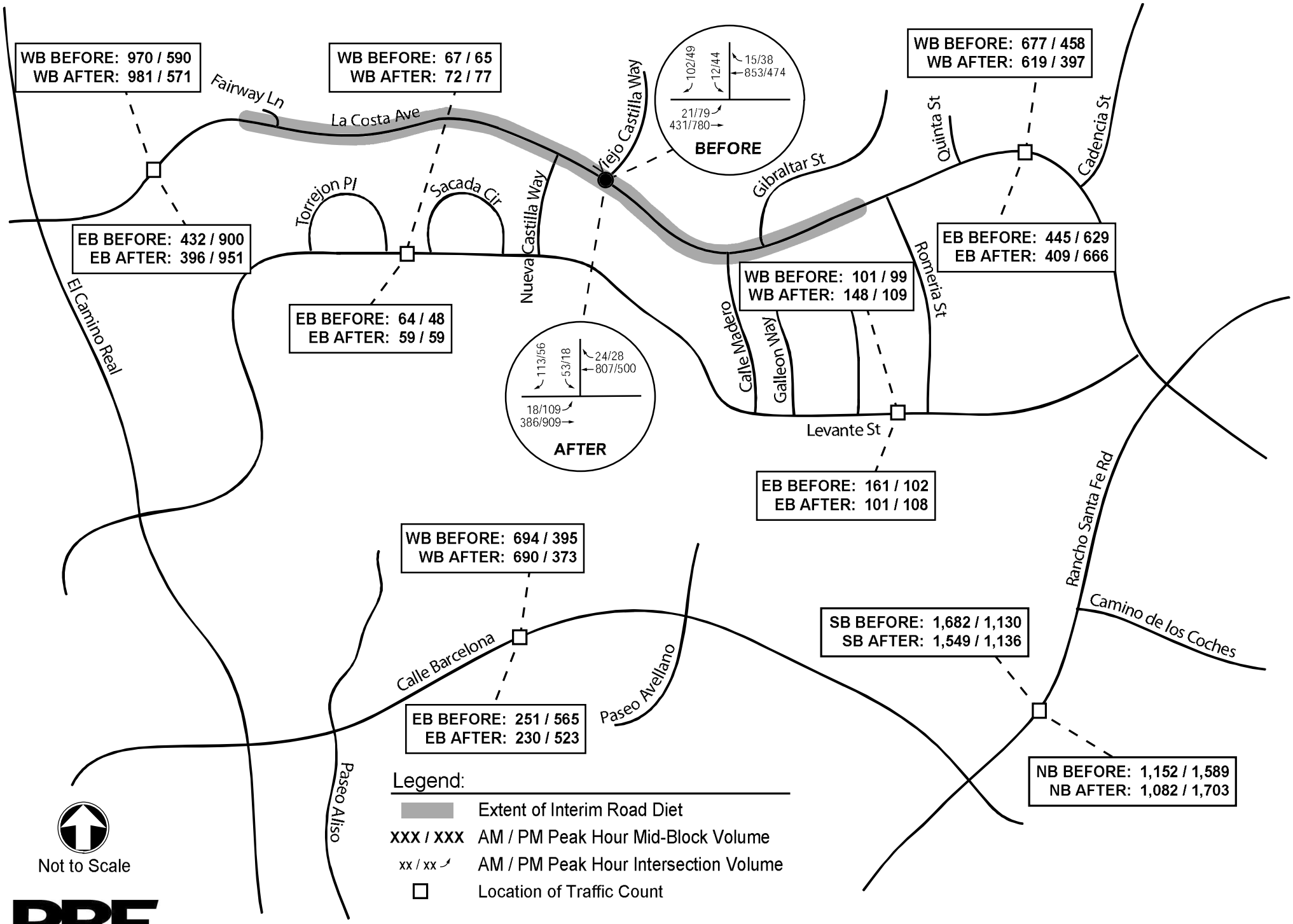
Exhibit 2



DAILY VOLUMES BEFORE AND AFTER INTERIM ROAD DIET

JN 55-100776.001 OCTOBER 2011

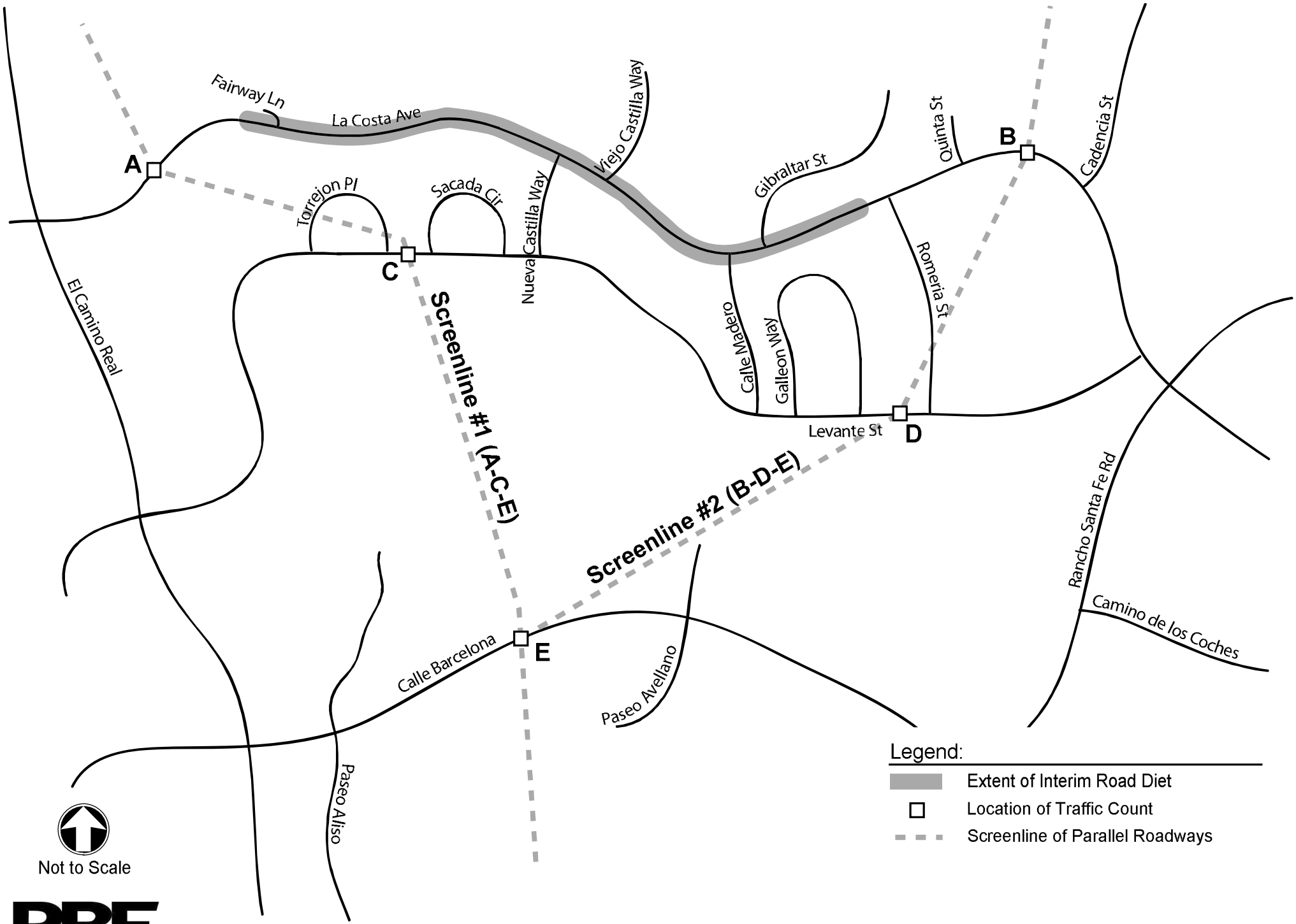
Exhibit 3



PEAK HOUR VOLUMES BEFORE AND AFTER INTERIM ROAD DIET

JN 55-100776.001 OCTOBER 2011

Exhibit 4



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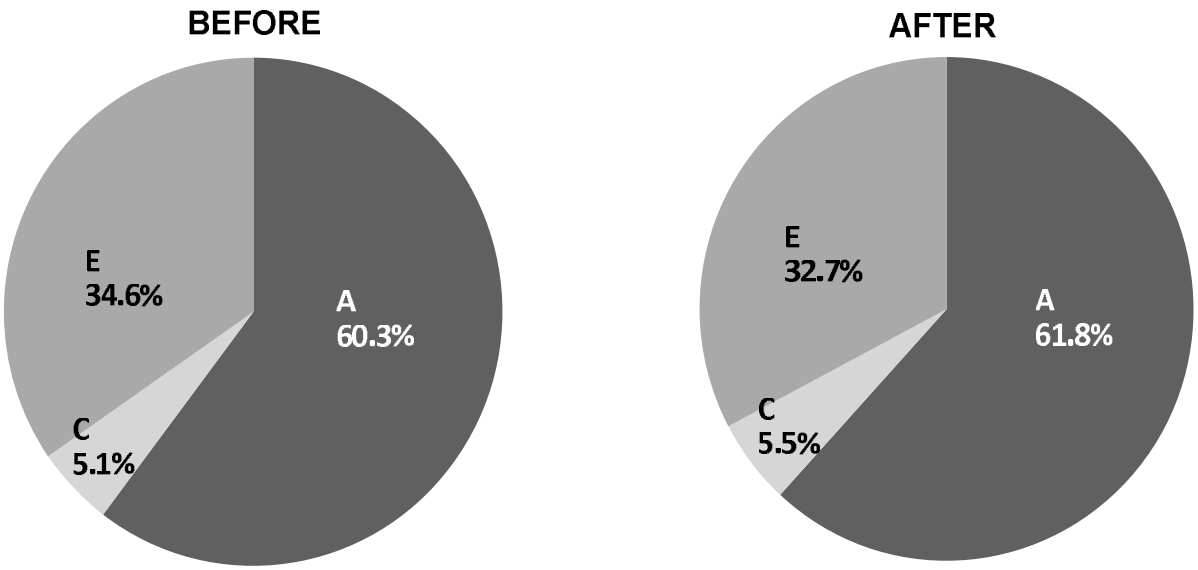
SCREENLINES FOR COMPARISON OF PARALLEL ROADWAYS

JN 55-100776.001 OCTOBER 2011

Exhibit 5

SCREENLINE #1 VOLUME COMPARISON (A-C-E)
PERCENTAGE OF TOTAL SCREENLINE ADT



SCREENLINE #2 VOLUME COMPARISON (B-D-E)
PERCENTAGE OF TOTAL SCREENLINE ADT